

### REMARKS/ARGUMENTS

Claims 16 and 17 are resubmitted in original form. Claims 1-11 were previously withdrawn in response to a restriction requirement. Claims 12-15 are amended. No new claims are added. Accordingly claims 12-17 will be pending upon entry of the above amendment.

Claims 12-17 were rejected under 35 U.S.C. 103(a) as being unpatentable over McNicholas (US 4,468,234) in view of Fujii et al. (US 5,318,758), evidenced by Gustafson (US 4,285,918) and further in view of Solomon et al. (US 6,190,629B1), evidenced by Prueter et al. (US 6,364,940B1)

#### Claim Amendments

Claim 12 is amended to define a "gravity independent" method for removal of carbon dioxide and other trace contaminants from air in an environmental control. The "gravity independent" method comprises steps "whereby carbon dioxide and other trace contaminants may be removed from [the] airflow in variable gravity environments". These features are described in the originally filed specification in paragraphs [0017] and [0028]. Claim 12 is also amended to define that the step of rotating the carbon dioxide scrubber rotor is performed "to accumulate and remove" liquid adsorbent from "the carbon dioxide scrubber rotor". These features are described in the originally filed specification in paragraphs [0023] and [0024]. Additionally, claim 12 is amended to define that the step of rotating the liquid absorbent scrubber rotor is performed "to accumulate and remove" liquid acid wash from "the liquid absorbent scrubber rotor". These features are described in the originally filed specification in paragraphs [0032] and [0033].

Claim 13 is amended to define that a “pH value of the accumulated acid wash is restored to a value of about 2 by addition of acetic acid”. These features are described in the originally filed specification in paragraph [0019].

Claim 14 is amended to define a method for reconditioning contaminated liquid absorbent “in a gravity independent environmental control system”, which “reconditioning may be performed in variable gravity environments”. These features are described in the originally filed specification in paragraphs [0017] and [0028]. Claim 14 is also amended to define that the step of accumulating liquid absorbent is performed “by rotating the heat and mass transfer surface and removing the accumulated liquid absorbent from the scrubber with a pitot pump” These features are described in the originally filed specification in paragraphs [0023] and [0024].

Claim 15 is amended to define a step of accumulating cold liquid absorbent from a second scrubber is performed “by rotating the second-scrubber heat and mass transfer surface”. These features are described in the originally filed specification in paragraph [0024].

#### Examiner Interview

Applicants thank the Examiner for his time and willingness to discuss this pending matter. A telephone interview was conducted with the Examiner and his Supervisor on January 23, 2007 to discuss the rejection of the claims as made in the outstanding Office Action. Applicants proposed amending the independent claims to include definitions of features through which CO<sub>2</sub> may be removed from air under varying gravity conditions and more particularly by rotating scrubber rotors to accumulate and remove various fluids from their

respective scrubbers. Applicant submitted to the Examiner that such limitations would be outside the teachings of the cited prior art. The Examiner expressed tentative concurrence that the cited prior art did not anticipate or teach these features. While no specific agreement was reached, the Examiner agreed to consider the proposed amendments. The possibility was raised that an additional search may be conducted and additional prior art may be considered.

McNicholas (4,468,234)

McNicholas is cited in combination with Fujii et al. (5,318,758), Gustafson (4,285,918), Solomon et al. (6,190,629) and Prueter et al. (6,364,494), against claims 12-17 under 35 U.S.C. 103(a).

McNicholas describes a separator in which centrifugal force is principally employed to separate particulates from a fluid stream. As a collateral function the McNicholas apparatus may be employed to assist chemical reactions that involve gaseous components such as CO<sub>2</sub>. As observed by the Examiner, "contaminants then fall to the bottom of housing 18, collecting in the reservoir (Col. 5, line 18-20)".

The present invention, as described in amended independent claim 12, provides a "gravity independent" method for removal of carbon dioxide and other trace contaminants from air in an environmental control. The "gravity independent" method comprises steps "whereby carbon dioxide and other trace contaminants may be removed from [the] airflow in variable gravity environments". This aspect of the method of claim 12 is not taught or suggested by McNicholas. Indeed, McNicholas teaches a method that is expressly gravity dependent, in that it contemplates that contaminants "fall to the bottom of the housing 18".

Amended claim 12 also defines that the steps of rotating the carbon dioxide scrubber rotor and the liquid absorbent scrubber rotor are performed “to accumulate and remove” liquids from “[their respective] scrubber rotor[s]”. When these novel techniques are employed to accumulate and remove liquids from scrubber rotors, the method of claim 12 may be performed in variable gravity conditions. For example, the method may be performed in an aircraft that is flying vertically, or even flying in a path that produces a zero-gravity condition. The method may also be performed in a space vehicle. The methods taught by McNicholas would not operate under these conditions.

Claim 13 is amended to define a method wherein “pH value of accumulated acid wash is restored to a value of about 2 by addition of acetic acid”. A method for environmental control that employs acetic acid as a re-acidifier is particularly suited for use on self-contained vehicles because acetic acid may be produced onboard using well known biological processes. McNicholas does not suggest, in any way, the method of amended claim 13.

Claim 14 is amended to define its method as being inclusive of the “gravity independent” features described above with respect to claim 12. Additionally claim 14 is amended to define that a step of accumulating liquid absorbent for extraction from a scrubber is performed “by rotating the heat and mass transfer surface and removing the accumulated liquid absorbent from the scrubber with a pitot pump”. For the reasons cited above with respect to claim 12, McNicholas does not teach or suggest the method defined in amended claim 14.

Claim 15 is amended to define that a step of accumulating cold liquid absorbent from a second scrubber is performed “by rotating the second-

scrubber heat and mass transfer surface". As discussed above with respect to claims 12 and 14, performing accumulation of liquid in this manner facilitates use of the method of claim 15 in a variable gravity environment.

Claims 16 and 17 are dependent on claims 14 and 15 respectively and as discussed above, claims 14 and 15 now define inventions that are not disclosed or even fairly suggested in McNicholas. For the above reasons, applicants respectfully submit that dependent claims 16 and 17 are neither anticipated nor rendered obvious by McNicholas. Applicants respectfully request reconsideration and withdrawal of the rejection of claims 12-17 on the basis of McNicholas under 35 U.S.C. 103(a).

Fujii et al. (5,318,758)

Fujii et al. is cited against claims 12-17 in combination with McNicholas and Gustafson under 35 U.S.C. 103(a).

Fujii et al. discloses merely that amine based mixtures may be used for a CO<sub>2</sub> absorbent. In Fujii et al., contaminants are collected by falling through a tower structure (see Abstract). In that regard, Fujii et al. fails to teach or suggest, either singly or in combination with McNicholas and/or Gustafson, the novel and unobvious features which have been introduced into claims 12-17 with this amendment. Particularly, the gravity independent features of amended claims 12-17 are not shown or suggested in Fujii et al. As discussed above with respect to McNicholas, the inventions of claims 12-17 are now defined as methods which may function in a variable gravity environment.

For the above reasons, Applicants respectfully submit that Fujii et al. does not teach or fairly suggest the subject matter of claims 12-17.

Reconsideration and withdrawal of the rejection of claims 12-17 under 35 U.S.C. 103(a) based on Fujii et al. is requested.

Gustafson (4,285,918)

Gustafson is cited against claims 12-17 in combination with McNicholas and Fujii et al. under 35 U.S.C. 103(a).

Gustafson discloses that gases such as ammonia may be undesirable byproduct when amine based mixtures are used for a CO<sub>2</sub> absorbent. There is no disclosure in Gustafson of any techniques which facilitate CO<sub>2</sub> absorption in variable gravity environments. In that regard, Gustafson fails to teach or suggest, either singly or in combination with McNicholas and/or Fujii et al., the novel and unobvious features which have been introduced into claims 12-17 with this amendment. As discussed above with respect to McNicholas, the inventions of claims 12-17 are now defined as methods which may function in a variable gravity environment.

For the above reasons, Applicants respectfully submit that Gustafson does not teach or fairly suggest the subject matter of claims 12-17. Reconsideration and withdrawal of the rejection of claims 12-17 under 35 U.S.C. 103(a) based on Gustafson is requested.

Solomon et al. (6,190,629)

Solomon et al. is cited against claims 12-17 in combination with McNicholas and Prueter et al. under 35 U.S.C. 103(a).

Solomon et al. discloses merely that an acid wash may be employed in the context of cleansing exhaust gases. There is no disclosure in Solomon et al. of any techniques which facilitate exhaust gas cleansing in variable gravity environments. In that regard, Solomon et al. fails to teach or suggest, either singly or in combination with McNicholas and/or Prueter et al., the novel and unobvious features which have been introduced into claims 12-17 with this amendment. As discussed above with respect to McNicholas, the inventions of claims 12-17 are now defined as methods which may function in a variable gravity environment.

For the above reasons, Applicants respectfully submit that Solomon et al. does not teach or fairly suggest the subject matter of claims 12-17. Reconsideration and withdrawal of the rejection of claims 12-17 under 35 U.S.C. 103(a) based on Solomon et al. is requested.

Prueter et al. (6,190,629)

Prueter et al. is cited against claims 12-17 in combination with McNicholas and Solomon et al. under 35 U.S.C. 103(a).

Prueter et al. discloses a centrifugal device to mechanically separate oil and water in a well head. There is no use of a chemical absorbent in Prueter et al. nor is there any disclosure of a method for collecting a chemical absorbent. There is no disclosure in Prueter et al. of any techniques which facilitate gas cleansing in variable gravity environments. In that regard, Prueter et al. fails to teach or suggest, either singly or in combination with McNicholas and/or Solomon, the novel and unobvious features which have been introduced into claims 12-17 with this amendment. As discussed above with respect to

McNicholas, the inventions of claims 12-17 are now defined as methods which may function in a variable gravity environment.

For the above reasons, Applicants respectfully submit that Prueter et al. does not teach or fairly suggest the subject matter of claims 12-17. Reconsideration and withdrawal of the rejection of claims 12-17 under 35 U.S.C. 103(a) based on Prueter et al. is requested.

Dunson et al. (3,969,094)

Dunson et al. is indirectly cited against claims 12-17 in combination with Solomon et al. under 35 U.S.C. 103(a) to support the premise that an alkaline gas may be an amine.

In that regard, Dunson et al. fails to teach or suggest, either singly or in combination with Solomon, the novel and unobvious features which have been introduced into claims 12-17 with this amendment. As discussed above with respect to McNicholas, the inventions of claims 12-17 are now defined as methods which may function in a variable gravity environment.

For the above reasons, Applicants respectfully submit that Dunson et al. does not teach or fairly suggest the subject matter of claims 12-17. Reconsideration and withdrawal of the rejection of claims 12-17 under 35 U.S.C. 103(a) based on Dunson et al. is requested.



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### CONCLUSION

Applicant again would like to thank the Examiner for taking the time to discuss the proposed amendments in a telephone interview. Reconsideration and withdrawal of the Office Action with respect to claims 12-17 is requested. Applicant submits that claims 12-17 are now in condition for allowance. Early notice to that end is earnestly solicited.

In the event that the examiner wishes to discuss any aspect of this response, please contact the attorney at the telephone number identified below.

Respectfully submitted,

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